Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Marangoni stresses and drop breakup due to wall shear in a partially filled rotating cylinder[1] ANDREW WHITE, AZEEZ ODESANYA, THOMAS WARD, Department of Aerospace Engineering, Iowa State University — Drop deformation and breakup in a rotating cylinder partially filled with oil is studied. Experiments using a rotating cylinder are relatively new but we will demonstrate that they are analogous to studies involving tubes and other geometries. Surfactants are added to the drop phase in concentrations at and below the CMC while the rotation rate of the cylinder is varied. Of interest is the effect of interfacial surfactant transport on changes in oil film thickness, drop shape and the onset of tail streaming. Two Biot numbers comparing the importance of surfactant adsorption and desorption to convection of surfactant on the interface are estimated. As shown in previous work on drops and bubbles in tubes, the balance between surface convection, diffusion and adsorption can affect the placement of Marangoni stresses, resulting in thicker or thinner films than with clean surfaces. When surface convection is large, surfactant builds up at the tail and Marangoni stresses can lead to tail streaming when surface tensions are sufficiently small. Experimental results are compared to numerical simulations and to previous work on drops and bubbles in tubes.

[1]National Science Foundation (#1262718)

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Date submitted: 01 Aug 2015 Electronic form version 1.4